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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/828,357	04/19/2004	Bill J. Peck	10031095-1	4887

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EXAMINER	
CHO, DAN SUNG C	
ART UNIT	**PAPER NUMBER**
1634	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/29/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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Office Action Summary	Application No.	Applicant(s)	
	10/828,357	PECK ET AL.	
	Examiner	Art Unit	
	Dan-Sung C. Cho	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/9/2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) *25-33* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/19/2004 and 5/4/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Currently, claims 1-33 are pending.

Election/Restrictions

2. Applicant's election with traverse of Group I, Claims 1-24 in the paper filed 11/9/2006 is acknowledged.

Applicant asserts that elements of the claim of Group III are found in the remaining claims of the non-elected groups and therefore there would be no undue or serious search burden for examining all the claims. This arguments have been thoroughly reviewed but were not found persuasive. Invention Groups III and I are related as process of making and product made but are distinct because the product can be made by other device that does not use a fluid drop deposition mechanism but use vapor-deposition mechanism. Invention Group III and II are related as process of making and process of using the product. The use as claimed can be practiced with a materially different product. Since the product is not allowable, restriction is proper between said method of making and method of using. Invention Group III and IV are related as process and apparatus for its practice but are distinct because the process as claimed can be practiced by another and materially different apparatus that is not capable of making all the array different size. Invention V is drawn to an algorithm and is not related to group III, drawn to a method of fabricating a chemical array.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper. In addition searching them together

would present a search burden on the Examiner due to the extensive databases of non-patent literature. Groups I-V have been appropriately restricted on the basis of being both independent or distinct and presenting a search burden on the Examiner if they were to be searched together. Therefore, the restriction is proper and made FINAL.

Claims 25-33 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-8 and 11-18 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Fujimori (Fujimori et al., 2001, US 6328404 B1).

Fujimori teaches a method of printing a great number of tone values expressible in the respective pixels that results in many different sizes, shapes and tone expressions of printed dots (Abstract and Figure 19).

For the purpose of the instant rejections claim 1 is interpreted as a method comprised of two steps (a) determining a chemical array layout with features with a size (b) fabricating an array according to the array layout. "Size based on composition" is interpreted as determining sizes for different composition. The specification recites that

"each distinct polymeric sequence of the array is typically present as a composition of multiple copies of the polymer on a substrate surface" and "features of an array that differ in monomeric sequences (i.e., differ in composition) may be of different sizes". Further the specification recites "features of an array that include the same monomeric sequences or are of the same composition (i.e., replicate features) may be of different sizes" (paragraph 102). Therefore the claim is interpreted as making a layout and fabricating an array with different sizes.

Fujimori teaches a method of making a chemical array by (a) determining a chemical array layout in which each chemical array layout has a size that is chosen based on its image composition by taking a tone value in the range of 0 to 256 for each of cyan (C), magenta (M), yellow (Y) and black (K) with regard to each pixel included in an image composition, (b) making an array of dots with different ink chemicals according to the array layout (column 15, lines 9-14 and Figure 9). Because each color-corrected image has a wide range of tone values for a pixel, the size of the dot for each ink is determined based on the composition of the image (column 13, lines 6-13).

With regard to claim 2, Fujimori teaches a method of printing two different size dots or features (Figure 19).

With regard to claim 3 and 4, the term "probe composition" is interpreted as any composition because the term "probe composition" has not been defined by the specification to be limited to any particular type of composition. Fujimori teaches that the printer has four independent inks for C, M, Y and K. Therefore when a "black-and-white" printout is made using only the black color ink, the resulting array has different sizes of

the same composition of black ink. Similarly, because the printer Fujimori teaches has four independent inks for C, M, Y and K and each ink with its own array of ejectors, when the two different size dots are printed using two different colors the resulting array has two different sizes of the different composition of the color inks.

With regard to claims 5, 6 and 8, Fujimori teaches the printing is accomplished with a fluid drop deposition device consisting of piezoelectric element (PE) and nozzles (Nz) of various sizes wherein an application of high voltage as an activation signal to the PE causes an ink droplet to be ejected (Figure 4A and 4B and column 13, lines 57; column 14, line 4).

With regard to claim 7, Fujimori teaches a method wherein a CPU remotely creates outputs for the dot on-off signals at required timings to create the dots of the respective colors (column 14, lines 46-54 and Figure 5). Fujimori teaches that different sets of print data are made according to original image sizes such as: (a) a minimum-area dot made when a single waveform W1 is turned on; (b) a medium dot made when the driving waveforms W2 and W3 are turned on; and (c) a large dot made when all the driving waveforms W1, W2, and W3 are turned on.

With regard to claims 11, 18 and 24, Fujimori teaches a method of making a chemical array with different size features wherein modulating wavelength to orifice ejector(s) results in different volumes being dispensed because of high voltage activation on piezoelectric element. Fujimori teaches methods of making different sizes of dots such as the small, medium and large dotes, as explained above, by controlling driving waveforms (column 12, lines 9-20; column 13, lines 18-31 and Figure 6).

With regard to claims 12, 13, 15 and 16, Fujimori teaches controlling the volume of the ink ejected from an orifice ejector by modulating waveform W1 for a small dot that results in a single droplet of ink. When a medium dot is made waveforms W2/W3 are turned on to eject two successive droplets from the same nozzle. (Column 13, lines 18-31 and Figure 6).

With regard to claims 14 and 17, Fujimori teaches a method of using a printer that uses the plural driving waveforms to print variable-area dots in the respective pixels (Figure 6). The arrangement of nozzles consists of four nozzle arrays, wherein each nozzle array ejects ink of each color and includes forty-eight nozzles arranged in zigzag at a fixed nozzle pitch that can be independently controlled by considering the two-line arrangement of each nozzle array on each of the ejection head (column 12, lines 21-31; column 51-54; Figure 5). Therefore, when various sizes of dots are printed in different colors, various wavelengths would result in ejection of inks from different arrays of nozzles depending on colors of dots being printed.

4. Claims 1-11 and 22-24 are rejected under 35 U.S.C. 102(a) as being anticipated by Hsieh (Hsieh et al., March 2004, J. of Biomolecular Screening 9: 85-94).

With regard to claims 1, 11 and 24, Hsieh teaches printing various sizes of an different composition with a jet printing device wherein its piezoelectric ejectors are controlled by waveforms to influence droplet size of solution containing dye, buffer, DNA, cells and BSA-conjugated oligonucleotides (page 86 "Design and fabrication of the ejector" section; page 90, left column, paragraphs 1 and 2, Figures 2 and 3).

With regard to claims 2 and 3, Hsieh teaches printing same composition of different sizes when male human genomic DNA is printed (page 88, right column paragraph 1).

With regard to claim 4, Hsieh teaches printing same composition of different sizes when different compositions of various solutions are printed (page 86 "Design and fabrication of the ejector" section; page 90, left column, paragraphs 1 and 2, Figures 2 and 3).

With regard to claim 5-8, Hsieh teaches a fluid drop deposition device that is used as a "bioprinter" system with piezo element; a Pentium PC that controls a custom LabVIEW program, waveform generator boards and high voltage power supply for generating activation signal (page 88, left column lines 1-11; page 91, left column paragraph 3; Figures 2 and 3).

With regard to claims 9 and 22, Hsieh teaches printing oligonucleotide and genomic DNA nucleic acid array (page 91, left column, paragraph 1 and right column, paragraph 1).

With regard to claims 10 and 23, Hsieh teaches a method of printing an array with various number of drops of various solutions (Figure 4). When Hsieh prints cells and DNA/BSA solution using the piezoelectric ejectors Hsieh inherently teaches printing a peptide array (page 91, "3. Ejecting human cells" section; page 92, "4. Printing array with BSA-conjugated oligonucleotides" section). Claims 10 and 23 are interpreted as a method of printing an array with solutions that contain peptides. Cells contain

polypeptides and BSA is a polypeptide and therefore Hsieh teaches all the limitation of the instant claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 9, 10, 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujimori (Fujimori et al., 2001, US 6328404 B1) in view of Blanchard (Blanchard, 2002, US 6419883).

With regard to claims 9, 10, 19, 20-23, Fujimori teaches a method of making a chemical array with different size features wherein modulating waveform to piezoelectric orifice ejector(s) results in different volumes being dispensed because of high voltage activation on piezoelectric element. Fujimori teaches methods of making different sizes of dots such as the small, medium and large dots by controlling driving waveforms (column 12, lines 9-20; column 13, lines 18-31 and Figure 6).

Fujimori does not teach a method of making a nucleic acid or a peptide array and its associated reagents and a method of selecting signal from a database with a population of activation signals and feature sizes.

However, with regard to claims 9-10 and 20-23, Blanchard teaches methods of making oligonucleotide and peptide arrays using an automated piezoelectric ejector

(Figure 2). Blanchard specifically teaches use of print heads of EPSON STYLUS COLOR II™ (column 27, lines 19-26). Blanchard teaches the use of automated oligonucleotide synthesis by the solid-phase phosphoramidite method wherein pulse jet delivery of the activated phosphoramidite monomer in the coupling step is carried out (column 14, lines 42-60). Blanchard teaches that printing an oligomer array of nucleotides and amino acids with a jetting device is particularly suited for automation because of the repetitive nature of biopolymer array fabrication methods (column 1, lines 44-49; column 11, lines 34-36; column 24, lines 57-63). Blanchard teaches that inkjet printing technology in chemical synthesis would be particularly useful for full-scale synthesis of biopolymers (column 3, lines 49-55). Blanchard teaches that the method of biopolymer array fabrication using the inkjet technology is automated (column 26, lines 6-25).

With regard to claim 19, Blanchard teaches a method of software implementation wherein a computer program reads information regarding voltage waveforms for activating the piezoelectric pumps in the inkjet print head from a list containing the name of an oligo specification file storing the geometry of the desired pattern to be deposited in a particular array to be processed in a particular run (column 33, line 58 to column 34, line 4).

Therefore, it would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to modify the method Fujimori teaches and print nucleic acid and peptide arrays and use a stored information for printing specific features on such an array. Use of microdrop dispensers such as the jet printer with a

piezoelectric ejectors to generate bio-arrays of nucleic acids and polypeptides were well known in the art at the time invention was made, as exemplified by Blanchard. The print head used for paper printing and bio-array printing purposes use similar technology to the point that a "regular" paper print head such as spare part "Epson Stylus Color Printer" print heads are "the preferred print heads" used for printing polypeptide and polynucleotide arrays by Blanchard (column 27, lines 21-24).

The ordinary artisan would be motivated to use the printer to synthesize polynucleotides and polypeptides with solvent microdroplets using a PE printer because it is possible to manufacture bioarrays in large scale and the printer can be automated to print stored information reliably and reproducibly for reproducible array features printing. The ordinary artisan would be further motivated to "print" biomolecules such as nucleic acids and polypeptides, with the piezoelectric element (PE) jetting printers because the jetting device can be used to automate bio-oligomer array synthesis saving time and cost.

Conclusion

6. No claims allowable over the cited prior art.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Dan-Sung C. Cho whose telephone number is (571) 272-9933. The examiner can normally be reached Monday-Friday from 7:00 a.m. to 4:00 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram Shukla, can be reached on (571) 272-0735. Information regarding the status of an application may be obtained from the Patent Application

Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). The Central Fax Number for official correspondence is (571) 273-8300.

Dan-Sung C. Cho
Examiner

Jehanne Sitton
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PRIMARY EXAMINER
1/22/07